

WHAT IS CLAIMED IS:

- 1 ~~36 A1~~ 1. A medical apparatus comprising a shaft including a shaft distal end
2 portion and a shaft proximal end portion, and at least one active electrode disposed on the
3 shaft distal end portion, the shaft distal end portion having at least one curve proximal to
4 the at least one active electrode.
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- 1 2. The apparatus of claim 1, wherein the at least one curve comprises
2 a first curve and a second curve proximal to the first curve.
- 3
- 1 *redundant* 3. The apparatus of claim 2, wherein the shaft further includes a
2 proximal end portion, the proximal end portion being essentially linear, and the first curve
3 and the second curve are in the same plane relative to the longitudinal axis of the *shaft*
4 proximal end portion of the shaft, and the first curve and the second curve are in opposite
5 directions relative to the longitudinal axis of the proximal end portion of the shaft.
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- 1 4. The apparatus of claim 2, further including an introducer needle
2 having a needle lumen, the needle lumen adapted for passing the shaft distal end portion
3 therethrough, wherein the shaft distal end portion includes a distal linear portion, the
4 active electrode includes an electrode head located terminally at a distal tip of the shaft,
5 the first curve is characterized by a first angle and the second curve is characterized by a
6 second angle, wherein a transverse location of the electrode head within the needle lumen
7 is determined by the first angle and by a length of the distal linear portion.
- 8
- 1 5. The apparatus of claim 4, wherein the introducer needle includes a
2 needle distal end, and the shaft distal end portion avoids contact with the introducer
3 needle when the shaft distal end portion is advanced from and retracted into the needle
4 distal end.
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- 1 6. The apparatus of claim 1, wherein the apparatus is adapted for
2 ablating tissue during an electrosurgical procedure, the at least one curve defines a
3 specific curvature of the shaft, the specific curvature is provided during manufacture of
4 the apparatus, and the specific curvature is at least substantially maintained during
5 ablation of the tissue.

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7. The apparatus of claim 1, wherein the at least one active electrode includes an electrode head having a spike.

8. The apparatus of claim 7, wherein the electrode head includes an apical spike and a substantially equatorial cusp.

9. The apparatus of claim 1, wherein the at least one active electrode includes a filament and an electrode head, and the apparatus further comprises a first insulating sleeve encasing the filament, and an insulating collar disposed on a distal end of the first insulating sleeve and adjacent to the electrode head.

10. The apparatus of claim 9, further comprising a cylindrical return electrode on the first insulating sleeve, the return electrode located proximal to the insulating collar.

11. The apparatus of claim 10, further comprising a second insulating sleeve encasing a proximal portion of the return electrode.

12. The apparatus of claim 11, further comprising a shaft shield encasing at least a proximal portion of the second insulating sleeve, wherein the apparatus is adapted for connection to a power supply unit via a connector cable, the connector cable includes an electrically conductive cable shield, and the shaft shield is coupled to the cable shield.

13. The apparatus of claim 9, wherein the insulating collar comprises a material selected from the group consisting of: a glass, a ceramic, and a silicone.

14. The apparatus of claim 1, further comprising at least one depth marking located at the shaft proximal end portion.

15. The apparatus of claim 14, wherein the at least one depth marking comprises a radiopaque material.

1 16. The apparatus of claim 1, further comprising a tracking device
2 located at the shaft distal end portion.
3

1 17. A method of making a probe for an electrosurgical apparatus,
2 comprising:

3 a) providing a shaft having at least one curve therein, the shaft including at
4 least one active electrode and at least one return electrode;

5 b) providing a handle; and

6 c) affixing the handle to the shaft.
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1 18. The method of claim 17, wherein said step a) comprises:

2 d) providing an active electrode having a filament and a head, the head
3 attached to a first end of the filament;

4 e) encasing the filament within a first insulating sleeve, the first insulating
5 sleeve having a proximal end portion and a distal end portion; and

6 f) encasing the proximal end portion of the first insulating sleeve within a
7 return electrode.
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1 19. The method of claim 18, wherein said step f) comprises encasing
2 the proximal end portion the first insulating sleeve within a curved return electrode,
3 wherein the shaft adopts a first curve.
4

1 20. The method of claim 18, wherein said step a) further comprises:
2 g) prior to said step f), placing an insulating collar around the distal end
3 portion of the first insulating sleeve.
4

1 21. The method of claim 18, wherein the return electrode includes a
2 proximal end portion and a distal end portion, and wherein said step a) further comprises:

3 h) encasing the proximal end portion of the return electrode within a
4 second insulating sleeve, the second insulating sleeve having a proximal end portion and
5 a distal end portion; and

6 i) encasing the proximal end portion of the second insulating sleeve within
7 a shield.
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- 1 22. The method of claim 21, further comprising:
2 j) introducing a second curve in the shaft, wherein the second curve is
3 proximal to the first curve.
4
- 1 23 The method of claim 22, wherein said step j) comprises bending
2 the shaft at a location proximal to the first curve, wherein the first curve is in a first
3 direction, and the second curve is in a direction opposite the first direction.
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- 1 24. The method of claim 23, wherein the handle includes a connection
2 block, and the method further comprises:
3 k) coupling the active electrode and the return electrode to the connection
4 block.
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- 1 25. The method of claim 18, wherein said step d) comprises:
2 l) providing a filament having a first end and a second end;
3 m) heating the filament first end to form a substantially spherical head,
4 wherein the head is attached to the filament; and
5 n) forming the head to a defined shape and size.
6
- 1 26. The method of claim 18, wherein the at least one active electrode
2 includes a head and a filament, and the head includes a substantially apical spike and a
3 substantially equatorial cusp.
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- 1 27. The method of claim 17, wherein said step a) comprises providing
2 a shaft having a tracking device located on the shaft distal end or at least one depth
3 marking located on the shaft proximal end.
4
- 1 28. The method of claim 17, wherein said step a) comprises providing
2 a shaft having a mechanical stop located on the shaft proximal end.
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- 1 29. An electrosurgical system for treatment of spinal disorders,
2 comprising:

3 a power supply unit adapted for generating a range of selectable high
4 frequency voltages;

5 a shaft having a proximal end portion and a distal end portion;
6 an active electrode disposed on the distal end portion of the shaft; and
7 an electrically insulating collar disposed axially between the active
8 electrode and the return electrode.

9
1 30. The apparatus of claim 29, further comprising a return electrode
2 positioned proximal of the active electrode, and a connector assembly for coupling the
3 active electrode to the power supply unit.
4

1 31. The apparatus of claim 29, wherein the electrically insulating collar
2 comprises at least one of a ceramic, a silicone, or a glass.
3

1 32. The apparatus of claim 29 wherein the shaft has an outer diameter
2 no larger than approximately 7 French.
3

1 33. The apparatus of claim 29, wherein the distal end portion of the
2 shaft has a defined curved configuration, wherein the defined curved configuration is
3 retained until application of an external lateral force to the shaft.
4

1 34. The apparatus of claim 33, wherein the external lateral force is
2 applied by passing the shaft distal end portion within a lumen of an introducer needle,
3 wherein the diameter of the lumen is from about 105% to about 500% of the diameter of
4 the shaft distal end.
5

1 35. The apparatus of claim 29, wherein the distal end portion of the
2 shaft is steerable.
3

1 36. The apparatus of claim 29, further comprising a return electrode,
2 wherein the return electrode comprises a dispersive pad for attachment to an external skin
3 surface of a patient.
4

1 37. The apparatus of claim 29, further comprising an ancillary device,
2 wherein the ancillary device is selected from the group consisting of an endoscope, a
3 return electrode, an aspiration device, and a fluid supply device.
4

1 38. The apparatus of claim 29, wherein the power supply unit
2 comprises a controller that indicates if an electrically conductive fluid is present around
3 the active electrode.
4

1 39. The apparatus of claim 29, wherein the shaft has a length in the
2 range of from about 4 cm to about 25 cm, and a diameter in the range of from about 0.5
3 mm to about 2.5 mm.
4

1 40. The apparatus of claim 29, wherein the shaft has a length in the
2 range of from about 10 cm to about 25 cm, and a diameter in the range of from about 1.0
3 mm to about 2.0 mm.
4

1 41. An electrosurgical probe and introducer needle combination for
2 treating an intervertebral disc, comprising:
3 a probe including a shaft, the shaft including a shaft distal end, at least one
4 active electrode, and at least one return electrode, wherein the shaft distal end includes a
5 first curve and a second curve proximal to the first curve; and
6 an introducer needle having a lumen and a needle distal end, the introducer
7 needle adapted for passing the shaft distal end through the lumen, and for guiding the
8 shaft distal end distally beyond the needle distal end.
9

1 42. The combination of claim 41, wherein the shaft further includes a
2 shaft proximal end portion, the proximal end portion being essentially linear, and the first

3 curve and the second curve are in the same plane relative to the longitudinal axis of the
4 proximal end portion of the shaft. *Curve*

1 43. The combination of claim 42, wherein the first curve and the
2 second curve are in opposite directions relative to the longitudinal axis of the proximal
3 end portion of the shaft.

1 44. The combination of claim 41, wherein the first curve and the
2 second curve are separated by a substantially linear inter-curve portion.

1 45. The combination of claim 41, wherein the diameter of the lumen is
2 from about 105% to about 500% of the diameter of the shaft distal end .

1 46. The combination of claim 41, wherein the shaft distal end remains
2 substantially centrally located within the lumen when the shaft distal end is passed within
3 the lumen.

1 47. The combination of claim 41, wherein the shaft distal end is
2 located substantially centrally within the lumen when the shaft distal end is retracted into
3 the needle distal end.

1 48. The combination of claim 41, wherein the shaft has a length in the
2 range of from about 10 cm to about 25 cm, and a diameter in the range of from about 0.5
3 mm to about 2.5 mm, and the introducer needle has a length in the range of from about 10
4 cm to about 20 cm, and the lumen has a diameter in the range of from about 1.0 mm to
5 about 3.0 mm.

1 49. The combination of claim 41, wherein the at least one active
2 electrode is disposed at the distal tip of the shaft, the shaft distal end includes a distal
3 linear portion, and a transverse location of the at least one active electrode within the
4 lumen is determined by a length of the distal linear portion. *Curve*

1 50. The combination of claim 41, wherein the at least one active
2 electrode is disposed at the distal tip of the shaft, the first curve is characterized by a first
Curve

angle, and the first angle determines a transverse location of the at least one active electrode within the lumen.

51. The combination of claim 42, wherein the second curve causes a deflection of the shaft distal end away from the longitudinal axis of the proximal end portion of the shaft when the second curve is advanced distally beyond the needle distal end.

52. The combination of claim 51, wherein the second curve is characterized by a second ¹⁷⁰⁻⁵⁰⁰ angle, the first curve and the second curve are separated by a substantially linear inter-curve portion, and the magnitude of the deflection is determined by the second angle and a length of the inter-curve portion.

53. The combination of claim 41, wherein the shaft includes a mechanical stop, and the mechanical stop limits distal movement of the shaft within the lumen of the introducer needle.

54. An electrode for an electrosurgical probe, comprising:
a filament having a distal end; and
an electrode head connected to the filament distal end, wherein the electrode head includes an apical spike.

55. The electrode of claim 54, wherein the apical spike provides a high current density in the vicinity of the electrode head when a high frequency voltage is applied to the electrode.

56. The electrode of claim 54, wherein the electrode head includes a cusp.

57. The electrode of claim 56, wherein the cusp is located substantially equatorially on the electrode head.

58. The electrode of claim 54, wherein the electrode head further includes a substantially equatorial cusp, and the apical spike and the cusp provide high current density in the vicinity of the electrode head when a high frequency voltage is applied to the electrode.

1 59. A medical apparatus, comprising: a shaft including a shaft distal
2 tip, a shaft distal end portion, and a shaft proximal end portion, the shaft distal end
3 portion having a first curve and a second curve proximal to the first curve, wherein the
4 first curve and the second curve are in the same plane relative to the longitudinal axis of
5 the proximal end portion of the shaft, and the first curve and the second curve are in
6 opposite directions.

1 *Sub A2* 60. The medical apparatus of claim 59, further comprising an
2 introducer device having a lumen and an introducer distal end, the introducer device
3 adapted for passing the shaft distal end portion through the lumen, wherein the shaft distal
4 tip occupies a substantially central transverse location within the lumen when the shaft
5 distal end is passed within the lumen.

1 *change* 61. The medical apparatus of claim 60, wherein the shaft distal tip
2 occupies a substantially central transverse location within the lumen when the shaft distal
3 end is advanced from and retracted into the introducer distal end. *↑*

1 62. The medical apparatus of claim 60, wherein the shaft distal end
2 portion avoids contact with the introducer device when the shaft distal end portion is
3 advanced from and retracted into the introducer distal end.

1 63. The medical apparatus of claim 59, wherein the shaft includes a
2 distal linear portion, and a transverse location of the shaft distal tip within the lumen is
3 determined by an angle of the first curve and by a length of the distal linear portion. *1/2*

1 64. The medical apparatus of claim 59, wherein the second curve
2 causes a deflection of the shaft distal tip away from a longitudinal axis of the shaft when
3 the second curve is advanced distally beyond the introducer distal end. *1/2*

1 65. The medical apparatus of claim 59, further comprising an
2 electrosurgical probe, wherein the electrosurgical probe includes the shaft.

1 66. The medical apparatus of claim 59, comprising a medical
2 instrument selected from the group consisting of: a catheter, a cannula, an endoscope, and
3 a hypodermic needle.

Add A3 *→*